Catalyst

Journal of the Amateur Yacht Research Society

Number 54 December 2018

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As examples, the polar diagram p16 of *Catalyst 28* was re-created from a second generation photocopy, photos of shunting in the Champion article in *Catalyst 27* (pp 19-21) were screen grabs from a video supplied on DVD. The rest of the images in that article were scanned from photographs, and the text was OCRed (Optical Character Recognition software) or keyboarded.

Send a copy of your work (copyshops can scan to file and email for you):

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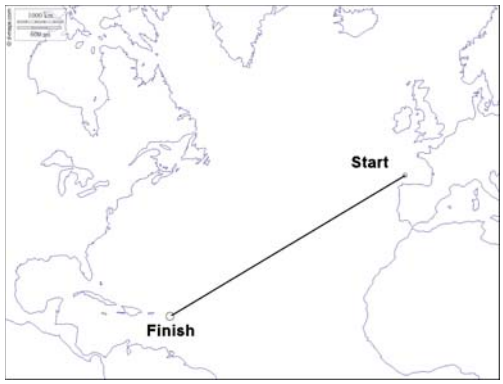
Features



Front Cover - Ian Smith's Biplane rig on the WRC 6800 catamaran.

Catalyst

Journal of the
Amateur Yacht Research Society

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Thank you to all those members who have returned the questionnaire. Replies are still coming in, but those I've seen make interesting reading.

It's clear that people want to know more about areas that Catalyst does not (for lack of articles) normally cover. There are calls for more information of powered vessels, chiefly electrical, but also new developments like wingsails and interestingly traditional rigs where the expertise is being lost. (Anyone experimenting with square rig, be it single sails on small boats or working sail on bigger vessels?)

Equally clear is that although it is getting somewhat less frequent than in the past, Catalyst is still welcome in people's post or inboxes; and there are calls for a supporting, less "technical", newsletter – although we hope that role is being largely met by posts on the AYRS Forum – https://www.ayrs.org/forum/. Note you need to register to get full access to this, but that is only a 10 minute job (most of which is waiting for the system to reply to your request). If you haven't registered, we recommend you do so.

More Articles Needed

With this issue I have run out of recent articles. I have a couple of old articles, which were not published at the time mainly because they needed too much work to get them into a suitable shape, but also in one case because I was not sure we have permission to publish or whether the article was sent to me just for my information. In each case, the articles need updating I believe.

So if you have an article and we've not published it, or if there is something new to write about, please review it, ensure it is up to date and send it to me again, (email: catalyst@ayrs.org); pictures too please. There is information inside the front cover about formats and things. Thank you

Simon Fishwick, AYRS Editor

Reminder *(assuming the post/email delivers this in time) - the AYRS AGM is on 20th January at Thorpe, Surrey, UK; see Calendar (page 40). We need desperately new volunteers on the Committee. The last two Committee meetings made use of Skype to avoid people having to travel, so living far from London is no hindrance any more! If you cannot make the AGM but are willing to help, please email secretary@ayrs.org.*

DIRECT MANUAL SHEETING FOR HYPERWIND SAILING

Barney Kenney, Ph.D.

Hyperwind sailing means sailing much faster than the wind (Kenney, 2001a). It is easily achieved when sailing on snow, ice or land; less so on a draggy surface like water (Kenney, 2001b; Kenney, 2017). Doell (2017) has published a video of two persons hyperwind sailing using a small 3.4 sq.m sail on a good ice surface in very light winds. The sail is rigged flat with a tight leach and little camber that produces only a small movement of the centre of effort with angle of attack.

When set to rotate on a stub mast with near zero static margin, the sheeting loads are so small that the sail can be sheeted directly by hand over 360 degrees using a lever. Because the mechanical advantage of a sheet line with multiple pulleys is not required, sheeting response is immediate.

When rigging, the top of the stubmast is clamped at a chordwise position along the boom for near-zero static margin (i.e. centre of effort on axis of rotation). Usually no adjustment is required when sailing. If surface conditions are so draggy that more sail power (i.e. camber) is required, the boom could be attached to a slide at the top of the stub mast and the yawing moment could be trimmed to zero on the fly with a trim control similar to a sheet traveller. To date, this has not been necessary.

Any size sail can be used appropriate to the wind conditions. The boom shown above is used with sails up to 6 sq.m. Sails up to 9 sq.m have been used successfully with a longer boom and mast to sail approximately 6 to 8 times the wind speed in zephyrs. The word "approximately" is used because it is not possible to measure wind speed with any accuracy in virtual calm conditions broken by a few puffs. It is very easy to see, however, which boat is moving and which boats are parked waiting for more wind.

A tell-tale is attached to the lever extending forward of the stub mast to provide a reference for the apparent wind angle and positive visual control over the angle of attack of the sail. The sail can be also backwinded for use as a very effective airbrake as well as used as a reverse gear to back out of tight spots. The quad yacht shown below has foot steering and there are no lines to impede the free rotation of the sail.

The rig is asymmetric and the straight boom and stub mast interfere with the sail camber on one tack. Like a sprit rig, the sail lays on the boom and stub mast on the unfavoured tack distorting the performance polar. Because hyperwind sails are rigged so flat, however, interference is minimal. The reduction of performance has been measured by GPS on one occasion at about 6% for the quad snow, ice and landyacht shown in the photos.

Using the lever extension forward of the stub mast, the yacht can be sailed clew first to eliminate sail interference on the unfavoured tack if it becomes excessive. However, fat head, loose leach and twisty high-camber sails do not work well when sailed clew first. Such aerodynamically inefficient sails are not well suited to hyperwind sailing in general and are seldom used.

References

Doell, J.E., 2017. Ice Sailing at Ghost Lake. Youtube Video URL: https://www.youtube.com/watch?v=8XagTK0YGwI&t=0s

Kenney, B.C., 2001a. Hyperwind Sailing. Catalyst, J. Am. Yacht Res. Soc., 6, 24-26.

Kenney, B.C., 2001b. High Efficiency Ski for Sailing on Snow or Ice. United States Patent 6257620.

Kenney, B.C., 2017. Hyperwind Sailing on Snow, Ice, Land and Water. Catalyst, J. Am. Yacht Res. Soc., 52, 4-14.

Acknowledgements

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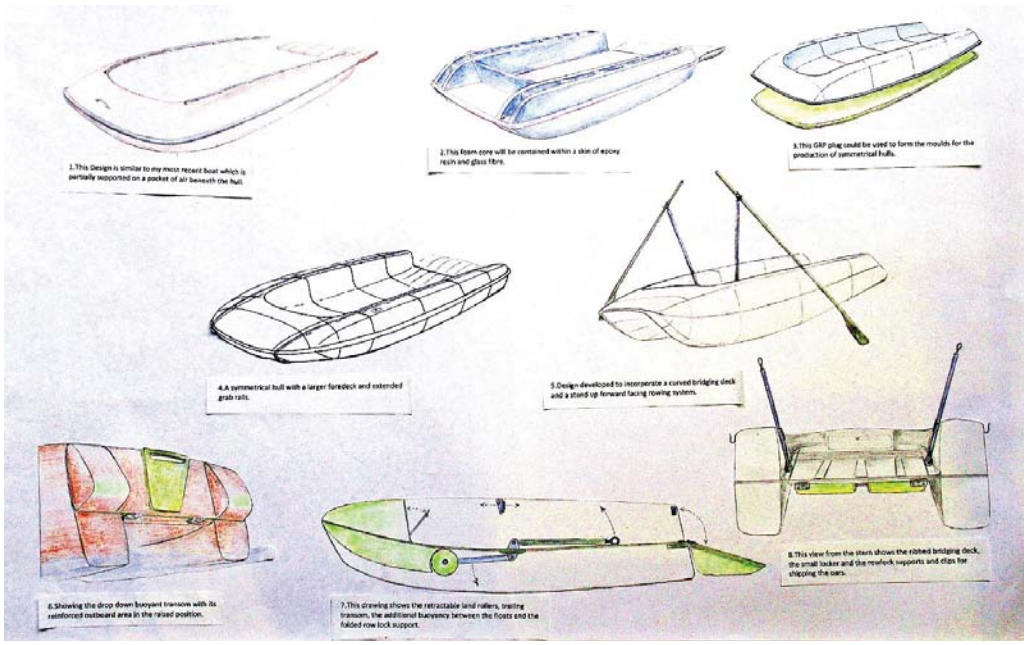
YELLOW ALERT!

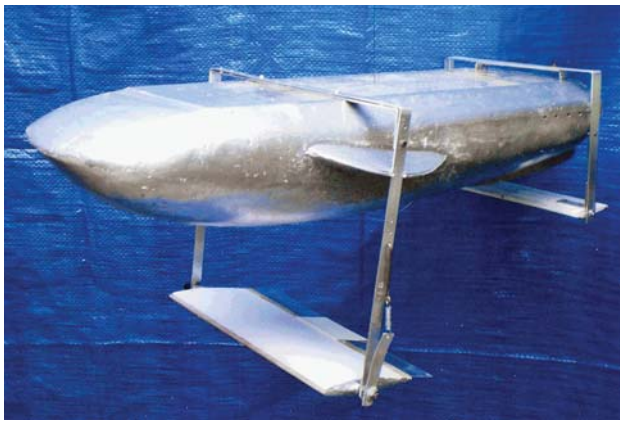
A Surf Rescue Boat with an "H" cross section hull configuration.

Chris Watson

I started building boats in 1951 aged 14 and have been doing so ever since, enjoying the making of them as much as the sailing. The process for me starts with a sketch, a few simple plans and occasionally a model.



I had three years of art training specialising in sculpture and considered boat models in much the same way as a sculptural maquette in that it helps to visualise the final outcome. A boat is of course a functional object and must conform to certain absolutes if it is to be any good.



Over the years I've made numerous experimental working models (see above) investigating the potential of wind, wave, and solar energy to power a craft, and also to see if there were any benefits to be had for a craft to be partially supported on a cushion of air. The most promising results came from a wave powered model with a hull in the form of a catamaran with streamlined baffles between the hulls at the bow and stern and a longitudinal baffle/keel down the centre. This was launched on a windy day into the North Sea and set off in the direction of Holland until it was restrained when it came to the end of its 100 metres of nylon cord .

By using more or less the same design on a full-size boat (see above prior to panelling floats and decking) with the inclusion of foam filled voids. I now had an excellent platform from which to carry out experiments, to observe models in the water and to try out sculling and forward rowing devices. I expected the boat to be more stable than a round seam or V bottom craft, but wondered if it would be better than a flat bottom?

When the boat was tilted the air under the lower side was unable to pass the central baffle and was becoming more compressed whilst, on the upper side, a partial vacuum was forming.

The result was to stiffen any pitching movement. I can't honestly say that it made much noticeable difference to the drag or amount of energy needed to propel it compared with a normal 8ft. pram dinghy. However, it was very stable indeed. This was to be the first of my "H" configured hulls.

I wasn't thinking of adding to my fleet of 6 small boats (my wife's terminology) until I was on holiday in Jersey where I had once lived and started becoming a serial boat builder. My grandchildren, all keen swimmers and surfers, were in the sea and as a diligent and anxious grandparent I was on the shore doing my best to keep them in sight hoping the two young Australian lifeguards on duty were doing the same. Later I talked to them and thought them very courageous relying, as they were, on their expert swimming skills, a couple of surf boards and an inflatable dinghy (which would have been difficult to launch in the sea conditions at the time). I put it to them that a boat that could broach that surf would be really useful. They implied the only small craft that could get through the breakers might

be a surfboard or jet ski. "So if anyone's got a boat that could cope with these conditions, bring it on," they said. I could see what they meant. Even getting a totally unsinkable surfboard through the line of breakers takes a great deal of strength and skill. The waves crashing in, only to retreat almost as quickly, were creating an under tow and the resulting foam would not readily support anything other than the lightest boat. Like a surf board, the boat's buoyancy would have to have been totally encapsulated within its shell. The bow would need to be wave piercing, yet at the same time not being prone to being pushed down too much.; therefore the bow area would need to be particularly buoyant. I thought of the "H" hull section boat I had just completed.

I soon realised this boat would not be suitable. Built of wood it was too heavy, had a closed transom and could have caused injury to swimmers with its hard chines and ribbed under side. Focusing on the idea of a surf rescue craft, my next design was to be a small catamaran, also with the "H" configured hull that could be rowed or motored. I decided to construct it with a polystyrene foam core coated in epoxy resin, filled and smoothed with polyester resin filler, then covered with a skin of fibre glass and more epoxy resin to be finally painted with a solvent based paint (a long process). This was my first attempt to build the unsinkable, lightweight boat that would be viable in the event of a total capsize (Pics 8 9 10 11).

Although it was less than 8ft. long and has not as yet been put to any extreme test, it does seem to tick most of the boxes. It's easy to row standing up facing forward and because the oars are tethered, keeping one's balance isn't difficult.

Kim Fisher (AYRS member) witnessed its maiden voyage and joined me aboard. It coped with our combined weight of 29 stone, but I must admit there wasn't much elbow room. Normally this boat would not have a transom thus allowing any shipped water to flow away quickly. However, I needed to see how it would perform with an engine and had made provision for a temporary transom to be slipped on and off to accommodate an outboard. With the low wetted-area the 3.5 HP outboard pushed it along much more quickly than any other boat I had used it on.

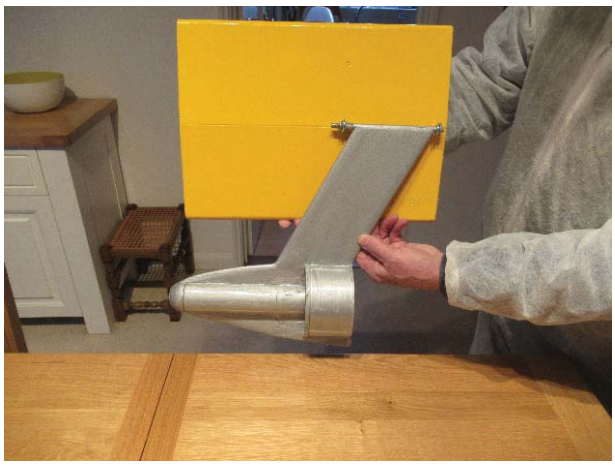
After some discussion, Kim and I decided to develop this design further and make a mould from which to produce a boat that would accommodate the best features and some additional ones, but with a more professional finish. Kim is a product designer with a great knowledge of materials and is extremely skilled in using them to achieve first class results. The new boat, a work in progress, will be more than a metre longer but with more or less the same beam. Bearing in mind what the Jersey lifeguards had said, and more recently talking to a helicopter winch man and an Air Sea Rescue pilot who have made some more suggestions as to what would be required of the boat and its equipment, we will be incorporating them into the design.

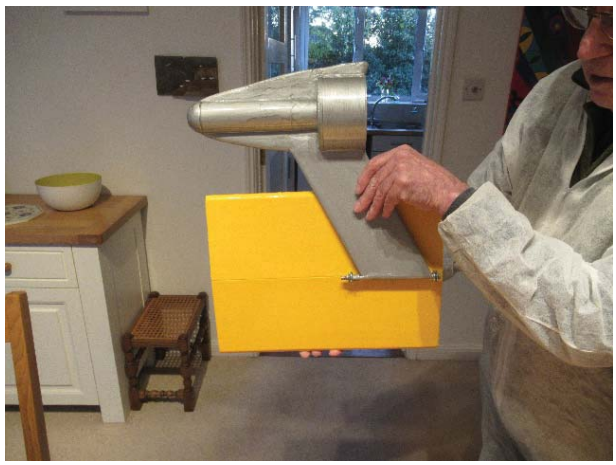
As I mentioned earlier, the boat performed well with the motor but this does present some problems. If the boat was to roll over, the motor would be the first casualty and even if not, it would be in the way when hauling anyone on board over the stern. The solution may be to use, besides the oars, one or two electric thrusters of the type used on powered surfboards. These would operate whichever way up the craft was floating.

Raised stainless steel grab rails are to be fixed to **all 4 floats** and when on the underside, will provide protective runners for grounding.

It's envisaged that the boat will stand off the beach beyond the line of swimmers and surfers and if conditions permit, will be paddled or motored in the previously mentioned forward facing standing position as do some Italian and Australian lifesavers. Aluminium tubes with captive rowlocks will be slotted into moulded grooves in the hulls to enable oars to be used standing up and facing forward.

When standing, the visual range is of course increased, essential when locating anyone in choppy water. Apart from their own observation, the person manning the boat could be directed from the shore by radio or phone to the rescue area by any one who is aware of an emergency in the water. As one can see from the photos, this project is well underway, the plug is almost complete and will soon be ready for a mould to be taken off it.



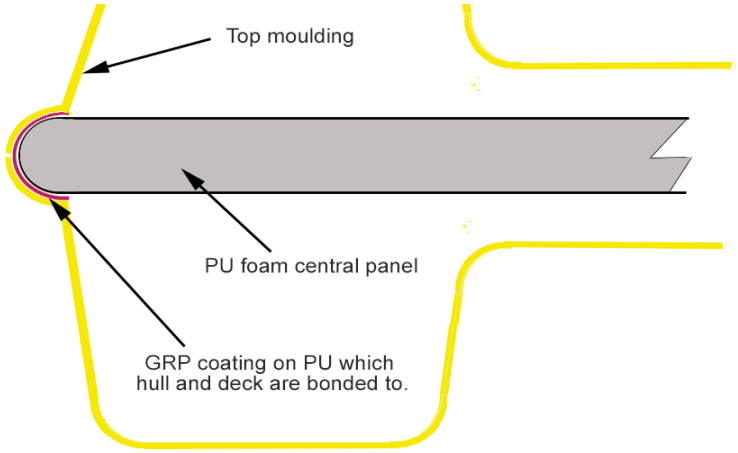


Next steps:

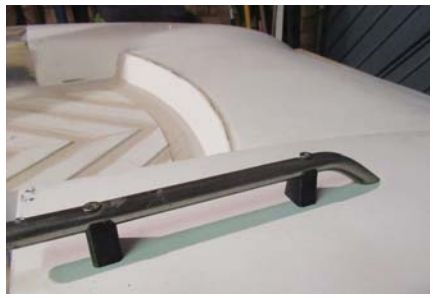
Complete the hull mould making - then cast off two mouldings which will have the rails attached. These will then be bonded together around the PU foam central panel. Four drain plugs will be added to the sterns of the hulls. A central recess in the mouldings will enable a 'life line' to be threaded through the deck to aid rescues and boat retrieval.

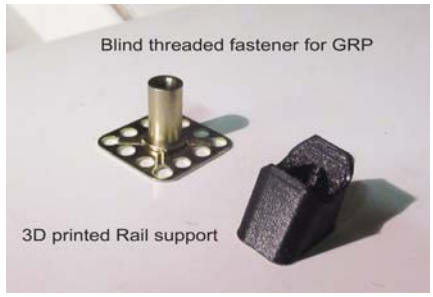
Second-hand oars will be modified with loop grips on their 'water ends' to provide an additional device for people in the water to hold onto.

The hull/deck mould will be made with the aft 400mm being a separate part of the tool to enable easy moulding extraction. This will also allow different versions to be created with transoms and motor pods etc for further experiments.



The project is now well underway retaining the original "H" section symmetrical hull made of two identical mouldings around a core foam panel.





Again, there's no permanent transom and the sloping bridging deck is situated midway up on the inside of the catamaran type hulls making for an easier entry from the water. The rear section of the deck has stiffening ribs running fore and aft so that a person in the water can be slid on board over the wetted surface. The forward deck surface changes to a chevron pattern running at 45 degrees to the centre and hulls to provide maximum strength and grip. The large volume of air contained in the forward section is there to create lift and lessen the chances of plunging under the waves..

Windriggercat – an update

Ian Smith

Photo 1 – WINDRIGGERCAT 5600

The following is a review of my project aimed at producing a family-sailing boat - a boat which is resistant to capsizing, easy to rig, exciting to sail, comfortable, affordable and trailerable. The Dory-hull catamaran shown in Photo 1 satisfies these requirements. It was first launched in Jan 1995 and sailed on lake, river and estuary waters during eight years of experimental development of various keels, centreboards, rudders, sailrigs and trailering designs. It provided good-fun sailing for me, my children and adult friends. In the year 2001 I commenced development of round-hull trailerable multihulls designed for off-shore sailing – and which occupied me for the following 13 years.

Aspects of the project I consider worth reporting follow:

THE OUTSTANDING RESULTS OF PROJECT WINDRIGGER

- The biplane sailrig using sailboard sails.
- Beam change mechanisms for trailing multihulls.

Photo 2 – the catamaran planed with four adults on-board.
Photo 3 – note the stub-masts supporting the mainsheets and
Photo 4 – the cockpit and rudder located on the catamaran bridge deck.

- Tandem sailrig and other sailrigs using sailboard sails
- Lateral resistance for windward sailing.
- Hulls and Amas for multihulls'
- Design and construction

I have renamed my project MULTIHULL TRAILER SAILERS and invite comments addressed to Ian Smith - smithvanaalst@bigpond.com.

THE BIPLANE SAILRIG USING SAILBOARD SAILS

Photo 1 shows WINDRIGGERCAT 550 sailing to windward powered by two 7.5 sq.m sailboard sails rigged as a biplane sailrig. I chose the biplane sailrig because it was used on the catamaran Crossbow II in 1980 to sail a record speed of 36 knots.

I elected to use sailboard sailrigs because of my sailboarding experience and the fact that during 1991 a sailboard was timed at 44 knots.

Windriggercat sails are rigged on unstayed masts – an outcome of my experience sailing an OK Dinghy and a Laser. These craft have an unstayed mast which flex and spill wind-gusts, resulting in reducing the possibility of capsize. My only criticism of these sailboats is that their Bermudan sailrig sheeting system applies considerable axial forces and curvature to its mast increasing the chance of breaking it. A sailboard sailrig uses a wishbone boom to tension its sail and a unique sail-shape which collectively does not produce axial forces on its mast.

On a sailboard, sheeting force is applied at chest height by a sailboarder standing and pulling the wishbone to windward. To negate this athletic skill I installed the stub-masts shown in photo 6. The stub-masts each support and guide a single rope from the sailboard wishbone-boom-end, to pulleys at the top of the stub-mast and down to near-deck level. This system produces a mainsheet tension is no more than the sail force.

Photo 5 – The Windrigger sailrig comprising a mast support tube fitted over the sailboard mast and into the sailboard luff-sock and positioned with its top just below the wishbone/mast attachment. Its position is fixed by a wood spacer located within the mast support tube.

Photo 6 – WRC6800 round-hull catamaran with non-batten sailboard sails - furled by wrapping the sail around its mast.

Because the *Windriggercat* mast is unstayed, its sail is free to rotate 360 degrees around its mast - following unhitching its mainsheet. This provides the simple safety response to overpowering winds - just unhitch its mainsheet and let the sail feather the wind eliminating the need to reef or unrig the sail. To test this, I left *Windriggercat 5600* with its sails set, on a mooring for

Photo 7 – WRC 5600 catamaran on a River Clyde mooring at Nelligen

(Photo 8 is on the front cover. Note the flat decks. The original round decks were very difficult to walk on)

Photos 9 & 10 – Beam change for trailering WRC6800 and ....

two weeks and it survived without wear and damage.

Following one of the first sailing trials in 1995, I found stretch marks on the mast tube (at deck level) indicating that it had exceeded the elastic limit of aluminium. So I solved the problem by replacing the 2mm wall thickness tubes with tubes of 3mm wall thickness.

BEAM CHANGE MECHANISMS FOR TRAILERING MULTIHULLS

See Photos 9 – 11.

Photo 10 - Its trailer with rails to support the catamaran. Note the trailer tilt mechanism located at the drawbar

Photo 11 (below) – Beam change system for the Dory catamaran

THE TANDEM SAILRIG USING SAILBOARD SAILS

Photo 12 & 13 show my 6.8 metre LOA fibre-glass hull mounting two sailboard sails, setup as a proa and trialled during 1998. This sailrig can be rigged to power a reversing proa by installing a stub-mast at each end of the hull.

Trials of the proa with the white pipe ama conducted in 2001 provided my first experience of sailing the 6800 FRG hull as a proa. It sailed fast and was easy to control. The Tandem sailrig proved to be an ideal sailrig for proas and trimarans.

Photos 12 & 13

Photo 14 – Sailrig supported by wire stays

OTHER SAILRIGS USING SAILBOARD SAILS

Clockwise from top left:

Photo 15 – Sailrig on unstayed mast

Photo 16 – Reversing sailrig for an Atlantic proa

Photo 17 – Sailboard sailrig Pacific proa

Photo 18 – Children's sailrig on a tacking proa. Note that the ama is stowed inboard for trailering

AN ADVENTURE WITH CORREX

Mike Howard

My interest in CORREX, a twin walled Polypropylene sheet, began about three years ago. CORREX, or COROPLAST as it is known in the USA, is used in the packaging, advertising and building industry. Most people will recognise it as the material used for Estate Agents' signs. It is commonly found in 2mm and 4mm and occasionally in 6mm, 8mm and 10mm thicknesses and is generally either black or white in colour. Some thicknesses, especially the 4mm, are also readily available in half a dozen bright colours. Sheet sizes are usually 2440mm x 1220mm but some variation on these sizes occurs between different manufacturers. 3050mm x 1525mm sheets are manufactured in the 8mm and 10mm thicknesses but they are hard to source.

Length	Width	Thickness	Wt/m^2	Colours
2400 - 2500	1200 - 1220	2mm	270	B & W
2400 - 2500	1200 - 1220	3mm	350	B & W
2400 - 2500	1200 - 1220	4mm	700	B,W & 5 colours
2400 - 2500	1200 - 1220	5mm	1050	B & W
2400 - 2500	1200 - 1220	6mm	1200	B & W
2400 - 2500	1200 - 1220	8mm	1600	B & W
3000 - 3050	1500 - 1525	8mm	1600	B & W
2400 - 2500	1200 - 1220	10mm	2000	B & W
3000 - 3050	1500 - 1525	10mm	2000	B & W

Weight given in grammes/square metre (gms/m^2); Colours may be available in other thicknesses apart from 4mm. Compare: Ocoume marine plywood - 700 grammes/square metre per mm thickness; and Far Eastern exterior grade hardwood plywood - 900 grammes/square metre per mm thickness

2mm thick CORREX is extremely flexible and is generally used as a protective covering during building refurbishment work or as protective packaging. It is ideal for model making and is widely used by model aircraft hobbyists. I have also found several instances where it has been used for high speed racing type model boats. The 4mm thick sheets are the most commonly used in amateur boatbuilding. There are two grades available - Corona Treated which is used in the printing industry and the untreated variety used in the building and packaging industry. The former grade has a higher resistant to UV light but for 'cheap and cheerful' boatbuilding I utilised the untreated version.

In the USA, Paul Elkins (www.elkinsdiy.com), is well known for his innovative use of COROPLAST for both boat hulls and homeless shelters; and Ken Simpson (www.portableboatplans.com), better known for his demountable sectional plywood boats, has produced a number of designs for small lightweight portable craft manufactured from COROPLAST. Many of their designs can be folded flat so they will stow in the boot of a car, hatchback or pick-up truck. Their designs belong to the American 'Cheap & Dirty' philosophy, where a boat can be 'knocked together' in a couple of days at the lakeside, used for a summer and at the end of the season placed in a skip for recycling. This is not a philosophy embraced by British boat owners.

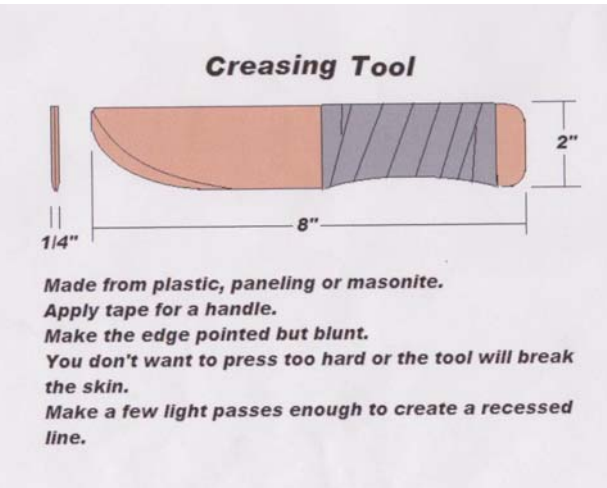
Project Objectives

I am a senior citizen of limited agility and over the past few years I have found great difficulty in both manhandling and getting into and out of a small boat, especially if it had flimsy topsides such as an inflatable dinghy or canoe. My main aim for this project was to gain practical experience in working with CORREX and to then produce a boat which was easy to manhandle and easy to get in and out of. Stability when afloat was another important parameter. I am sure there are many AYRS members out there, who like me, suffer lack of mobility and a lightweight, easily transported and stable boat would, I am sure, increase their access to the peaceful inland waterways of this country.

Interestingly, there are several YouTube videos of these COROPLAST craft in action but there is no footage of the occupants getting into their boats!

Strictly speaking there was not much pioneering spirit involved in this project. Two out of the three boats I intended to build had been specifically designed to be manufactured using CORREX sheet and had already been prototyped by their designers. Numerous websites and several YouTube videos featured the building and operation of these interesting craft. I was able to download free plans and instruction sheets from the Internet.

With a career spent in Engineering Design, my brain tends to work along very well established paths, and almost all of the methodology I employed was well proven, although often used in a unique way. CORREX is almost impossible to bond to itself or other substrates so my efforts were concentrated on utilising a variety of mechanical fastening systems, not all of them used in conventional small boat construction.



I purchased five sheets of 4mm thick white CORREX, four sheets, 1220mm x 610mm of 9mm thick smooth faced exterior plywood, a 20 metre x 75mm wide roll of GORILLA waterproof adhesive tape and 100 - 100mm long x 2.5mm and 200 - 160mm long x 2.5mm plastic cable ties, most of which I bought through E-Bay. My final outlay, which included a few extras items not mentioned in the above list, was £168.85. All the other materials I utilised came out of my workshop stock. This included off-cuts of 4mm, 5mm and 9mm thick plywood, some marine grade some just exterior grade; eight lengths of American Ash, 3.0 metres long by 20mm x 20mm and half a dozen lengths 1.5 metres long by 10mm x 10mm; Gorilla Glue, Wickes Exterior/Interior water based Varnish and all of the fasteners, some stainless steel, some just zinc plated.

Building a CORREX Punt

The first boat I built was Ken Simpson's lightweight folding pram/punt, designated CPB-1A. I followed Ken Simpson's downloadable PDF instructions. The fold and cut lines were marked out on a full sheet of 4mm CORREX using a whiteboard marker. I manufactured a plywood 'scoring tool', as recommended by Ken in one of his free on-line tutorials.

The folds were 'scored' using this tool, which was drawn along the straight edge of a long length of 50mm x 5mm mild steel strip. Creases were formed against the edge of this batten on the inside face of the sheet according to the instructions. Sections which needed to be removed were easily cut out with a sharp craft knife using the mild steel strip as a guide edge. The boat was then folded up into a three dimensional shape. Holes were pierced in adjoining panels using a pointed auger and 100mm long x 2.5mm wide plastic cable ties were used to hold the edges together. This entire procedure took me less than an hour and a half.

A full length floor (1340mm x 580mm) was made up from one of the 1220mm x 610mm x 9mm thick plywood sheets plus an off-cut of 9 mm marine grade plywood. Two cross members of different lengths were also cut from some 20mm x 20mm American Ash I had in stock. Ken's instructions say to cut two - 24 inch (610 mm) long struts but in fact, looking at photographs of the shape of the finished design, they come out at 700mm and 800mm. The Ash was also used to place a length of timber across the outside of the bow and stern transoms. A short

section of the extreme ends of each of the transoms was folded vertically so that the lengths of timber lay parallel to the cross members. Two longitudinal deck beams were then added each end and were screwed to the cross members and the bow and stern transom pieces. A further length of Ash was placed along each side as a gunwale between the forward and after cross members.

Fixing the timber to the CORREX was accomplished with a 15mm long x 3.5mm diameter dome shaped washer headed self tapping screw. The CORREX was pierced with a pointed auger and a guide hole driven into the Ash. The screw was tightened just enough to depress the outer face of the CORREX sheet. The 9mm diameter washer head of the self tapping screws easily spanned the 4mm corrugation width of the CORREX sheet. To fix the cross members to the CORREX sheet a 30 mm long countersunk head screw was inserted into a plastic washer with a matching countersink.

Two views of my CorroPunt

The forward and after decks were cut from leftover pieces of shiny white uPVC interior decorative ceiling panels. They were fixed in place in a similar way to the cross members, but with shorter countersunk head wood screws sitting in the plastic washers. It goes without saying that all of the woodwork received at least three coats of Wickes Exterior/Interior Varnish either prior to installation or on completion.

The floor was fixed in place by driving countersunk head screws through the floor and the bottom of the CORREX hull into two 20mm x 20mm Ash bilge runners positioned on the underside of the craft. Side frames, cut from 9mm marine plywood, were then screwed and glued to the floor and deck cross members at both the break of the bow and stern decks. Finally small knees cut from 40mm x 20mm hardwood were glued and screwed in place, securing the Ash gunwale to the side frames. The result was a sturdy and reasonably good looking craft.

The final stage was to seal the joints in the CORREX. The areas of the CORREX which were to be covered with the GORILLA tape were first wiped over with Wickes Non Toxic Clean Spirit, a product used for cleaning paint brushes. The area was dried with a clean soft cloth before the tape was applied. GORILLA tape, black in colour and 75mm wide, was carefully placed equidistant about the joint and pressed into place, avoiding creases wherever possible. The deck edges were treated in the same way. Finally the deck edges adjacent to the deck coamings were sealed with marine grade clear silicone sealant. A stainless steel eye was fitted in the bow to take a painter. The final piece of sealing was to turn the boat upside down and seal along the edges of the bilge runners where they met the CORREX bottom, again with marine grade clear silicone sealant.

The entire building programme for both boats was spread across the summer months of July, August and September. To begin with, I did not record the time I spent building the first boat. However, by careful analysis of my diary, which I meticulously type up each day, I estimated that the CorroPunt, as I called it, took 30 hours to complete at a cost of £45 to £50. The build had been fairly

straightforward with a logical path from beginning to end. I estimated at least forty percent of the build time was spent painting and varnishing. I was also interested to see how much it weighed. The finished weight came out at 13 kilogrammes (29 Pounds).

Building a CORREX Canoe

The second boat I built was a combination of two similar designs by Paul Elkins, displayed in a free download called the CORRO-CRUISER. This design is canoe like at the bow but has a square transom. The longer version, which comes out at 2130 mm long, can be used as a single handed short canoe. Alternatively, two long versions can be bolted together at their transoms to form a double ended two man canoe, 4260 mm long. The shorter version comprises two short hulls bolted together at their transoms to form a double ended one man canoe, 2890 mm long. I chose to produce one long section and one short section and bolt them together to form a single man asymmetrical double ended canoe, 3575 mm long.

The bow is shaped by a series of clever 'in and out' creases which brings the bow together in a multi chine/almost round bilge pointed form. I used a complete sheet of 4mm thick CORREX to form a 2130 mm long hull and a 1750mm length, cut from a full sheet, to form the 1445mm second hull.

Once the bow had been formed the inner 'cheeks' of the bow were held together with several M5 round head socket head set screws, repair washers and nuts, all in stainless steel, which I happened to have in stock. On one bow I used a couple of pieces of 5mm thick plywood each side to act as a clamp but it made little difference compared to the clamping effect of the bow held together by individual bolts.

Considerable force was required to draw the bow shape together. Undersize guide holes were pierced through the several layers of CORREX and then the set screws were worked through the guide holes. The crease which formed the 'chine' was also secured in a similar way at their extreme forward end with the M5 set screws, repair washers and nuts. The pointed bow was then pulled together using half a dozen of the 100mm long x 2.5mm plastic cable ties.

Immediately the two hulls were brought together with their transoms abutting I could see a major problem. The effect of the folded bow tended to force the topsides out so they had about ten to fifteen degrees of flare. However by following the instructions, the topsides at the transom came out vertical. This was fine for an individual single sheet boat but produced a very odd gunwale shape when two hulls were to be joined together, transom to transom. I came to the conclusion that although Paul Elkins had illustrated these variants he had never actually built them.

In order to determine the amount of flare I could tolerate at the point where the two transoms joined together, I released the clamps holding the transom shape. I then utilised a long 40mm x 6mm hardwood batten, which I had scarfed and glued together earlier, to determine the shape of the gunwale of the combined hulls. As I wished to keep the watertight integrity of each half hull, I measured the amount of flare at the transom joint. I then reconfigured the transom folding pattern to produce the required flare, which increased the beam by about 80mm. I carefully re-scored the CORREX and ensured it followed the new flared shape when re-folded and secured.

I had already made up a transom for the forward hull from 4mm thick plywood reinforced with 20mm x 20mm Ash. As it was rectangular in shape it was now modified by cutting one end to suit the flare and adding a matching 'wedge' to the other end. A matching transom was also made to suit the after hull. The transoms of the two CORREX hulls would eventually be sandwiched between these two plywood transoms.

9mm thick plywood floors were then made for each section of the hull. This took some time as the bottom shape of the hull was easily distorted by forcing the plywood downwards. The floor shape finished up quite different from that shown on Paul Elkins drawings. A length of 20mm x 20mm Ash was glued to each end of each floor. The two transoms were secured to one end of each floor, while a partial bulkhead, supporting a cross member, was attached to the other end of each floor. The amount of time spent cutting, gluing and then painting the two floor/bulkhead structures occupied almost a week of fine sunny days.

Finally, the two hulls were united. This part of the build had taken an inordinate amount of 'thinking time' as I chewed over various methods to pull the two hulls tightly together. First of all each floor/bulkhead assembly was attached to its individual hull. This was accomplished by attaching the CORREX transom to the upper edge of the bulkhead using 13mm long x No.4 countersunk head wood screws. These were driven home so that their heads partially

depressed the outer face of the CORREX. Then the two hulls were clamped together at the top of their transoms.

The two hulls were then attached together using side straps. Each side strap consisted of a piece of 5mm plywood 160mm long x 40mm wide and positioned well below the gunwale on each side of each hull. When attached to each hull, through several layers of CORREX, using the M5 set screws, repair washers and nuts, the two sides of the hulls were held tightly together but could still be adjusted to align their bottom faces. Next a continuous centre keel, cut from a length of 20mm x 20mm Ash, was secured with 30mm long x No8 wood screws. The screws passed through the 9mm floor, the CORREX hull and into the keel. Once complete, the two hulls were now united.

I had already tried to bend a long length of 20mm x 20mm Ash around the gentle curve of the canoe's gunwale. The result was that the Ash was stronger than the CORREX and resulted in a distorted shape. I needed to find something which was much more pliable while maintaining a fair curve. I had seen small bore plastic pipe used to strengthen the gunwales on several of the CORREX boats I had found on the Internet.

Three views of my CorroCanoe

After much thought I honed in on the idea of using 22mm diameter uPVC domestic waste pipe combined with a 40mm x 6mm hardwood batten. I made up a small sample, by threading a plastic cable tie from the inside face of the CORREX, through the hardwood batten, around the uPVC pipe and back through the hardwood batten and CORREX. When the plastic cable tie was pulled tight it seemed to form a very secure assembly.

I scarfed four lengths of 40mm x 6mm hardwood batten and bonded each pair of them together with GORILLA glue. When set, I sanded the joint reasonably fair. I then made up a jig which allowed me to drill a pair of vertical holes in the hardwood batten to suit the outside diameter of the uPVC pipe. Sets of holes, 3.0mm diameter and at 100mm centres, were then drilled along the length of each of the hardwood battens. I drilled additional holes at 50mm centres at each end of the battens.

I had accidentally discovered that a 90 degree uPVC elbow fitted quite snugly against both the bow and stern profiles. I started by solvent welding two

1350mm long lengths of 22mm diameter uPVC pipe to a 90 degree elbow. I then clamped each hardwood battens to the canoe at three or four spots along the length of the gunwale until I had obtained a fair curve. Next, starting at the bow, I pierced the CORREX with a pointed auger, using the holes in the batten as a guide. I threaded a 160mm long x 2.5 plastic cable tie through the assembly and tightened it on the inside of the hull. The first couple of cable ties were quite difficult to assemble, but once the batten and pipe were held tightly in place against the outside of the hull, the rest were reasonably easy to assemble.

I tensioned each of the battens in turn from the aft end and having obtained a fair curve, tied it off to the after hull with a temporary plastic cable tie using the last pair of holes in the batten. Once secure, each batten was trimmed to length. I made up a second pipe assembly by solvent welding two 1350mm lengths of 22mm diameter uPVC pipe to a 90 degree elbow. Starting from the stern, I attached the pipe assembly and the batten to the after hull exactly as I had done with the forward hull. When both sets of uPVC pipes were well secured to the hull I cut and solvent welded a make up piece of uPVC pipe to the forward and after pipe assemblies using straight uPVC couplings.

As I had proceeded along the length of the gunwale I had driven a 30mm long x No8 countersunk head wood screw through the 40mm x 6mm gunwale batten into, firstly, the forward bulkhead cross member and then, secondly into the forward hull transom cross member. A major error now showed itself. The aft bulkhead was too high and the cross member was too long! I tried to pull the sides of the aft hull to match the cross member but this merely distorted the shape of the aft hull. I cut off the cross member from the bulkhead and having cleaned up and trimmed the cross member and the top of the bulkhead, I cut the cross member to fit snugly against the inside of the hull and re-glued it to the aft bulkhead.

After undercoating and glossing the area of the aft bulkhead/cross member which had been modified, I continued tying the gunwale batten and uPVC pipe to the CORREX hull. When completed, the hull was reasonably fair with a pleasant sweep to the gunwale. The final job was to seal up the open ends of the CORREX at bow and stern. This was achieved with several layers of 75mm wide GORILLA tape. This was carefully applied and slit in places to avoid creases. The end result looked reasonably tidy.

For some unknown reason the tops faces of the two transoms (mid section joint) did not match so I cut a piece of 40mm x 6mm hardwood batten and glued it to the top of the aft transom. This was later faired, sanded and painted. The final act was to add a stainless steel eye to the forward bulkhead for the attachment of a painter. To draw the bottom seam tighter together, I cut two pieces of 20mm x 20mm Ash to act as bilge runners. After varnishing, these were secured to both the forward and after floors with countersunk head wood screws while the bottom seam was pulled tightly together. My final act was to completely seal the edges of both the keel and bilge runners where they met the CORREX bottom of the canoe.

My observations of the finished craft were that I had produced a reasonably handsome canoe. Due to the fragile nature of the CORREX, especially in the joint area where the re-folding had taken place, gaps were present between the hulls at the turn of the bilge, but all other joints were reasonably tight. Given that this was probably the first time that two CORREX canoe hulls had ever been joined together I was reasonably satisfied with the result, after all this was hardly a Concours d'Elegance build!

Regarding the build time for the CorroCanoe, it took just on 52 hours to build at a cost of £75 to £80. That is a whole heap more hours than the designer originally intended. However it still compares favourably with a stitch and glue plywood canoe. Once again a large proportion of my time, at least 45%, was spent painting and varnishing. I also weighed the CorroCanoe and it came out at 16 kilogrammes (35 Pounds).

Trials

The two finished boats were taken on different occasions to Crosby Adventure Centre, a 65 Hectare man-made lake which caters for all forms of boating. They were both very easy to load on and off the roof rack of my Renault Captur, which is quite a high vehicle. The CorroPunt could be lifted up bodily. In fact it travelled home in the rear of the vehicle with the rear seats folded down and the boot lid secured with bungee cord to the towing ring under the vehicle. The CorroCanoe was easily roof-racked on and off the vehicle single-handed and travelled upside down at 50 mph quite happily.

The CorroPunt was tested first. With one end aground on the launching ramp, I was able to step aboard and sit down on a foam cushion which had

been placed on the floorboard. By shifting my weight I managed to float the boat off the ramp. Using a double kayak paddle I gingerly propelled the boat parallel to the shoreline, backwards and forwards from the starting point, gaining in confidence on each run. It was not a boat I would want to paddle in water more than waist deep! Perhaps it would be ideal for a single child or perhaps two children rather than a 12 stone something adult. In fact I sold the CorroPunt to a guy who intends to use it on his mill pond for the enjoyment of his two small children.

The CorroCanoe was easy to get into and out of, lying just afloat on the launch ramp. Once aboard and sitting on the cushion with my back against the bulkhead, I used a double kayak paddle to propel it easily, both forwards and backwards. At first I ran parallel to the shoreline but very soon gained enough confidence to cross the lake. The flat bottom combined with the flared bow and stern gave it lots of initial stability. My weight compared to the weight of the canoe meant it sat low in the water with just the minimum amount of freeboard. I did have an issue with leakage which seemed to come from the floorboard/keel screw connection. Additional external sealant fixed the problem. I sold the CorroCanoe to a guy of my age (74) who intended to use it on our local canals.

Conclusion

Whilst the CORREX sheet material is reasonably easy to work with it has severe shape limitations. To provide a degree of rigidity a complicated internal structure is required, in particular, in the floor region. As a canoe, it is probably as robust as the inexpensive inflatable canoes and kayaks you can buy these days for around £180 to £250. The CORREX canoe is cheaper, lighter and more easily handled and manoeuvrable both on and off the water.

If I were to build another one I would not waste hours painting it. A two day build for less than £75 and leave it upside down when not in use would probably give me two to three seasons. Boating folk are very conservative and although the two CORREX boats created some interest around the boating lake and at the Northern Boat Show where they were displayed, no one offered to buy them! I did sell them both through E-Bay and just about got my money back. The material still intrigues me. I have several sheets of CORREX in stock and some plywood offcuts. What can I build next I wonder?

Theoretical Optimization of the Length of Surf Ski Kayaks

Ralph William Baker

Abstract

This project has been undertaken with the aim of finding a method by which the length of a surfski kayak can be optimised in terms or having least possible resistance. Surf ski kayaking is a highly competitive international discipline that takes place on open ocean, it differs from other forms of kayaking because of the lack of regulations regarding the length of the boats. An aim of this work was to determine if the boats on the market today are fully optimised in terms of having a length with least resistance. Through use of software that incorporates thin ship theory as well as skin friction data from ITTC '57 it was possible to calculate the wave making and frictional resistances for a series of lengths of Wigley hull forms with constant displacement and beam. This allowed a total resistance to be calculated for each length which in turn leads to an apparent 'optimum' length. In terms of boats currently available, it appears from the results that they have indeed been optimised effectively however only for a small weight range of user. A conclusion of this work is that there may well be scope for manufacturers to produce boats better suited for other weight ranges of kayaker or paddler as they are more often known.

Unfortunately the full paper is too large for a single issue of Catalyst, so it can be found on the AYRS website at https://www.ayrs.org/surf-ski-optimization/

Microtransat Challenge 2018
Application to the AYRS HOWARD FUND

Richard Walker

EXECUTIVE SUMMARY

For many years now the Amateur Yacht Research Society has appeared to be in decline. Its former prominence at the forefront of sailing yacht hull and sail design has been somewhat eclipsed by the powerful forces of industry who have spent vast amounts of money to fund development and sponsor International yacht racing on an epic scale. Behind the scenes a number of AYRS members have been upholding the tradition of the Society but without creating any public awareness of their achievements.

The Microtransat Challenge 2018 appears to be just the sort of project that the Society should be participating in. It will bring together many different areas of knowledge concerning the optimisation of a small ocean going craft. It will, I hope, help to illustrate that AYRS is not embedded in the past but very much at the cutting edge of marine technology. This will undoubtedly, help to boost AYRS reputation and put the Society 'back on the map'.

Unlike the previous challengers, who in the main have been undergraduate students, the AYRS Microtransat Challenge 2018 Project Team, all of whom are members of AYRS, bring to the table a wide range of technical and practical experience in small boat design, manufacture and operation as well as a lifetime spent in commerce and industry.

Harnessing the talent of the project team, together with the moral and financial support of the Society, this project can be brought to a successful conclusion.

HISTORY OF THE MICROTRANSAT CHALLENGE

The Microtransat Challenge is a competition (not a race as such), originally conceived by Dr. Mark Neal of Aberystwyth University and Dr. Yves Briere of Institut de l'Aeronautique et de l'Space (ISAE), based in Brittany. It is open to all comers, whether individuals, groups or businesses, to design and build an autonomous sailing boat and sail it across the Atlantic Ocean.

Since the introduction of the Microtransat Challenge in 2005, nine teams have made a total of twenty-two starts with sixteen different boats. These challenges were made during the period September 2010 to July 2017. In the Microtransat Challenge of 2017, three teams with four vessels officially started. Three boats were disqualified due to the loss of reporting and one boat was recovered.

The vast majority of the organisations that have entered the Microtransat Challenge to date are Universities and Colleges. The Universities of Aberystwyth (UK), ENSTA Bretagne (France) and Dalhousie (Canada) together with Epsom College (UK), Ecole Navale (France) and the United States Naval Academy (USA) have been amongst the front-runners. Several private individuals including, John Silvester (Team Joker, UK), Andy Osusky (OpenTransat, Slovakia) and Craig Gorton (Gortobot, USA) have also participated. One commercial company, Offshore Sensing A/S (Norway) have also entered a challenger.

Although prominent members of staff have directed the Academic Institutional projects, it has been the students who have assembled and tested the sailing boats. Almost without exception, the sailing boats have been based on model yacht hulls around one to one and a half metres in length. The exception to this is Andy Osusky's modified surfboard that was 2.35 metres long.

Almost every one of the challengers so far has been fitted with conventional soft sails in una or sloop rig. More often than not, the sail area has been somewhat reduced from that which the model yacht would normally carry when sailing on a boating lake.

The electronics packages used for computing and navigation have generally been of the simple 'hobbyist' variety, more often than not, housed in plastic 'clip lid' sandwich boxes mounted on the deck.

No single boat has yet achieved its goal to cross the Atlantic Ocean. The furthest a vessel has sailed is the 2015 ENSTA challenger *Breizh Tigresse*, which achieved 1427 kilometres before signal failure led to disqualification. However, 600 kilometres of this distance was sailed off course.

THE PROJECT TEAM

Background

A letter was delivered to AYRS Head Office in January 2017 from Richard Walker, the promoter of this application, asking for comments from AYRS members on his proposal to participate in the Microtransat Challenge. His letter was discussed at the January 2017 meeting of AYRS and subsequently it was published on the AYRS Website Discussion Group (Boats - Microtransat). Members were invited to air their views on the subject. Several members added comments, including Mike Howard.

On the 23rd March 2017 Mike Howard introduced himself by letter to Richard Walker. In the ensuing telephone conversation on the 10th April 2017 they agreed to join forces to promote the project. An open invitation to all AYRS members to join the project team was posted on the AYRS Website Discussion Group by Mike Howard on the 11th April 2017. Mike Howard had previously sent out an e-mail letter on the 23th March 2017 to all the members of the AYRS North West Local Group, giving details of the Microtransat Challenge and inviting comments.

In due course a project team was assembled from all of the AYRS members who had contacted Mike Howard to express an interest. Over the first few months several members dropped out due to other commitments while others expressed the wish to play a minor role. After two project team meetings a nucleus of seven members now remain. They are:

- Richard Walker – Electrical, Electronics and Software
- Mike Howard – Hull Design, Mechanical and Electrical Engineering
- Adrian Denye - Hull Design and Construction and Rig Optimisation
- James Neilson – 3D modelling, Weight Control and Stability
- Colin Weir - Wing Sail Design & Autonomous Systems
- Robert Biegler - Sail Systems
- Martin Walford - Ocean Routing

The strength of the Project Team lies in the diverse nature of the expertise of the individual members and their ability to absorb and correlate information. There are two Naval Architects, an Aeronautical Engineer, an Electronics/IT specialist, a Process Engineer and an undergraduate student studying Marine Engineering. All have extensive experience of small boat sailing or yachting.

Partnerships

In addition, a working relationship has been developed with the following organisations that have pledged their support for this project:

- National Oceanographic Centre (a division of the Natural Environmental Research Council) - Ocean Winds, Currents and Wave Data and Autonomous Systems
- Glyndwr University, Wrexham – Data on Wing Sail Design & Autonomous Systems, AYRS sponsored research projects.
- University Technical College, Wrexham – Assistance in a practical way with 2D and 3D design and the manufacture of bespoke parts and assemblies in stainless steel, aluminium and plastics in return for mentoring and commissioning.
- David Wren – Sea Trials Support

Support and assistance, with regards Customs, entry to foreign countries and repatriation of the autonomous craft, has been requested from Mersey Maritime Ltd, an organisation which represents the various facets of the Maritime industry on Merseyside.

A plea for support and assistance on our behalf was published in the 31st August 2017 edition of their online E-Zine magazine. In due course Frank Fox of Lombard Shipping has supplied the project team with valuable information.

THE PROPOSED CHALLENGER

The AYRS Microtransat Challenger is to be named LITE AYRS.

The hull will comprise a stabilised monohull craft embodying both outrigger floats and a ballasted fin keel. The hull, superstructure and outrigger floats will be of conventional construction utilising marine grade plywood, marine grade polyester resin and glass mat and cloth. Outrigger supports will be marine grade aluminium, GRP or carbon fibre tube. The craft will be powered by a rigid Wing Sail constructed of aluminium tube, extruded polystyrene (closed cell) foam, aircraft and/or marine grade plywood sheathed in a marine grade polyester resin and glass cloth laminate.

Two different hull forms have been proposed. Both hull forms have the backing of the majority of the Project Team. Both hulls will be designed to carry the purpose designed rigid wing sail. Trials under free sailing and radio control will be carried out to determine the most suitable hull form. The hull form that excels will then be manufactured to strict standards and act as the platform for the AYRS Microtransat Challenger.

The first hull form is a development of a scaled down version of a proven Catamaran Hull which has been optimised for this project by raising the stern section to increase the draught and then splitting the hull along it's longitudinal axis and inserting a 100mm wide parallel mid-body so that it resembles a scow type hull, reminiscent of the Mini Transat sailing yachts in vogue.

The second hull form is a development of Alberto Calderon's Transonic Hull. The underwater shape has been optimised to give a smooth flow of water under all sailing conditions. Towing trials utilising a simple half scale hull have been carried out to ensure this hull form acts as predicted.

Both of these hull designs have been created in 3D using Solidworks 3D software in order to optimise space and weight distribution. The completed 3D models have been imported into proprietary marine software to calculate trim and stability and verify recovery from knockdown and possible total inversion from 180 degrees.

The Wing Sail has been designed to take into account the low speed of the craft and the wind velocities it is likely to encounter offshore. The Wing Sail will be controlled by a tail fin which can be wirelessly set to bring the Wing Sail to optimum angle of attack for maximum lift in varying wind strengths. The process software is to be developed by students at Glyndwr University, Wrexham as part of an AYRS Microtransat Challenge 2018 sponsored research programme.

Each item of electrical and electronic equipment has been selected as 'fit for purpose'. The electronics package will comprise (CPU) Raspberry Pi3 SoC (running Linux) with scheduler and RealTimeClock, 2 x Arduino (ATMega328P) microcontrollers, MTK3339 GPS receiver, CMPS11 tilt-compensated digital compass, and Iridium Satellite comms system. SPOT GPS transmitter and 2 x stepper motor drivers.

All of this electronic equipment will be sheathed to prevent RF interference and housed in watertight (IP68) enclosures within watertight compartments. The enclosed equipment will be isolated from shock and vibration by a method developed by students from Glyndwr University as part of an AYRS Microtransat Challenge 2018 sponsored research programme. The watertight enclosures will be connected to the lead keel that will serve as a heat sink.

The electrical and electronic equipment will be powered by Lithium Ion batteries (2 sets) that will be housed in separate watertight enclosures. The batteries will be charged by solar panels mounted on the deck and controlled by a battery management system. The motor controlling the Wing Sail will have it's own solar panels and battery pack which will mean that the Wing Sail will not require a connection with the hulls battery supply and therefore be free to rotate through 360 degrees.

The rudder will be controlled by an Arduino MPU driving a stepper motor to provide accurate positioning of the rudder. Owing to the motor and rudder systems resistance to backlash it will be possible to completely power down the rudder system when not needed (saving a considerable proportion of the power demand).

All void space within the hull will be filled with closed cell polystyrene foam to create positive buoyancy in the event of the watertight compartments being flooded.

The craft will be fitted with an all-round white light having a range of 2 nautical miles to be activated at times of poor visibility. The hull and sail of the craft will be finished in a high visibility colour. Vinyl decals bearing the craft's name, its purpose, contact details and sponsorship will be affixed to each side of the Wing Sail and Hull.

The transit of the North Atlantic will be via a route commencing from the southern end of the starting line (51N,16W and 45N,8W) approximately 100nm offshore of Northern Spain to within a 25nm radius circle centred on the finishing line (10N,60W and 25N,60W) off the island of Antigua. Martin Welford and other members of the project team from Martin's Auxiliary Ketch currently overwintering in the area will undertake the launch.

The craft will sail a course that follows a set of pre-determined waypoints. The course will have been determined to minimise the distance travelled and to optimise the wind direction for the most efficient use of the Wing Sail. It is envisaged that the craft will sail within a pre-determined corridor for much of the voyage, allowing the electronic control equipment to be powered-down to conserve battery power.

Although the craft will sail autonomously as a function of the Microtransat Challenge there will be a facility to allow the project team to intervene and re-direct the craft should it become necessary (for safety reasons) to do so. This however would result in disqualification from the competition but not necessarily end the transit to the finishing line.

The craft will transmit its position every six hours via a SPOT Trace location beacon. The craft will also transmit position and other relevant data via the Iridium transceiver for the exclusive use of the Microtransat Challenge 2018 Project team and it's sponsors.

The environmental data collected will be handed over to the National Oceanographic Centre (a division of NERC) to aid their studies of the Atlantic Ocean.

Contribution To Nautical Science

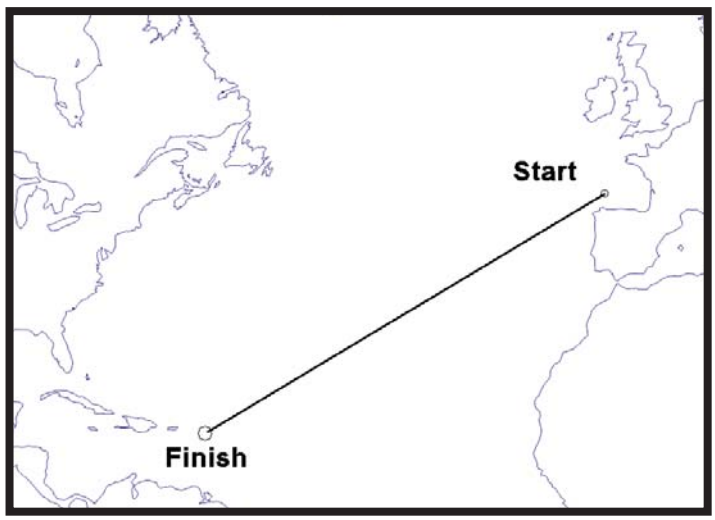
There are three specific areas which this project can influence are:

- Provide a proven autonomous system for the benefit of the Maritime Industry.
- Further the understanding of self-trimming Wing Sails on long distance voyages.
- Opening up the possibilities for disabled persons to enjoy sailing in an unaided but safe environment.

Project Objectives

The project is divided up into a number of discrete sections, each with an achievable milestone:

- To design, construct and test a robust and reliable sailing craft, which is capable of autonomous ocean voyaging.
- To launch the above craft from a suitable point so that it sails autonomously across the pre-prescribed Microtransat Challenge starting line, crosses the Atlantic Ocean unhindered, and terminates its voyage by crossing the pre-prescribed Microtransat finishing line within the tolerances indicated in the Microtransat Challenge Rules.
- To collect and relay the craft's global position to the Microtransat Challenge website every six hours in order to comply with the Microtransat Challenge Rules.
- To collect during the trans-Atlantic voyage, information on the craft's global position, speed and course, as well as the local weather conditions (wind strength and direction, relative humidity, air temperature and barometric pressure), sunlight levels and sea water temperature data, for the benefit of the National Oceanographic Centre, Liverpool.
- To recover the sailing craft and return it to the UK for inspection and analysis.
- Forward recorded evidence of the craft's trans-Atlantic voyage to the Microtransat Challenge Judges for verification and the award of the Challenge.
- To maximise publicity on behalf of the Amateur Yacht Research Society, the National Oceanographic Centre, Glyndwr University and any of our other Sponsors.



PROJECT DEFINITION

Initial Investigations

On the 10th April 2017, initial discussions of the proposed project took place between Richard Walker and Mike Howard. It was agreed that a Feasibility Study should be carried out. Richard Walker assumed the position of Project Director, but as he is still in full time employment he asked Mike Howard, who is retired, to act as Project Manager. On the 7th May 2017, a Feasibility Study document was issued to each of the project team members (nine recipients). The object of this Feasibility Study was not to ascertain if the project was feasible but to determine the parameters necessary for a successful challenge. The Feasibility Study was concluded on the 7th July 2017.

The first project team meeting was held on the 9th August 2017 when a review the responses to the Feasibility Study took place. In addition discussions took place on the specification for the challenging craft, route planning, programme, costing's and funding. The minutes of the meeting highlighted a number of actions that were, in the main, completed before the next project meeting.

A second project team meeting was held on the 27th September 2017. This meeting completed the discussions of the responses to the Feasibility Study and determined the final outline Specification for the challenging craft. It also finalised the timeframe, costing and the framework for this document.

At a third meeting on 3rd November between Mike Howard and Adrian Denye it was agreed to trial the catamaran alongside a transonic inspired contender.

Prototype design, manufacture and build

At the second project team meeting it was agreed to go ahead with Adrian Denye's proposal Design 'G'. A 3D design software package (SOLIDWORKS) has been used by James Nielson to model the proposed craft taking into consideration material and equipment weights and positions.

In parallel to this work, Colin Weir has designed a suitable Wing Sail profile.

In addition, Martin Walford has been studying the Pilot Charts for the North Atlantic Ocean in order to determine an optimum route for a Wing Sailed powered craft Richard Walker has been testing out the accuracy and the suitability of a Raspberry Pi module coupled to a simple GPS module.

Mike Howard has been co-ordinating events and preparing a Cost Schedule and Preliminary Programme.

Glyndwr University

Robert Bolam, a senior lecturer at the above University , who is also an AYRS member, has agreed to carry out two research programmes that have been proposed and sponsored by the AYRS Microtransat Challenge 2018 project team. First year undergraduate students, studying Aeronautics, Mechanical and Electrical Engineering and Electronics, between October 2017 and March 2018, will carry out the research. The two investigations are outlined below:

On the 3rd August 2017 two proposals for AYRS Microtransat Challenge 2018 funded research programmes were submitted to Robert Bolam. Both of the research programmes have been accepted and will be offered to the new intake of students in Late September 2017.They are:

- An Investigation into the durability of miniature microprocessors and allied electronics equipment and the protection of these devices from shock and vibration during an ocean voyage in a small sailing craft.
- The development of process software to control the angle of attack of a Wing Sail so that it produces optimum lift throughout a range of wind speeds.

Project Milestones

The following programme will be strictly adhered to. This is essential as we have a very narrow weather window in which to sail the craft across the Atlantic Ocean.

End December – Two trial craft completed. They will be radio-controlled which will initially be used to select the optimum performer, establish the position and balance of the Wing Sail. The chosen craft will later be retrofitted with an autonomous control system capable of remote intervention.

End March – Analysis of the preliminary trials programme completed and final specification for the ocean-going craft finalised.

End May - Ocean going craft LITE AYRS completed. Public announcement of AYRS Challenge.

End August – Ocean-going craft – lake, coastal and sea trials completed.

End October to End November – Launch window

End January - Latest Arrival in Antigua

End March - Voyage Analysis and Final report to AYRS complete

PROJECT TIMESCALE

Month	Event
01	Project launched
	Project Team assembled
02	Feasibility Study issued to PT
03	
04	Feasibility Study collated
05	First PT meeting
	3D model (Cat hull) complete
06	Second PT meeting
07	3D model (Transonic) complete
08	Progress report issued
	AYRS Grant Application complete
09	2 Trial craft complete
	Wing Sail complete
	Specification complete
10	Marina and Lake trials
11	Sea Trials
12	Analysis of Trials, AYRS Grant approved
	Final Specification complete
13	Challenger craft build
14	Challenger craft build
15	Marina and Lake trials, Research projects finalised
16	Sea Trials
17	Long voyage trials
18	
19	Earliest launch (Spain)
20	Latest launch (Spain)
21	
22	Latest Expected Arrival (W. Indies)
23	Repatriation
24	Final Analysis, Report to AYRS

PROJECT COST

Description	Total Cost
Production of Prototype Craft	£ 650
Production of Trials craft (Monohull)	£ 150
Prototype Trials	£ 500
Microtransat Challenger	£ 4350
Microtransat Challenger Trials	£ 300
Delivery of Craft to Launch Site	£ 1750
Repatriation	£ 3100
Basic Total	£10500
Contingency (15%)	£ 1583
FINAL COST	£12133

AYRS FUNDING:

Milestones for payment:	Funding
Payment 01 - Award of Funding -	£ 1000
Payment 02 - Prototype completes Trials -	£ 5000
Payment 03 - Challenger completes Trials –	£ 2000
Payment 04 - Challenger completes course -	£ 3000
Total	£11000

Balance of £1190 funded by Project Team members:

SUCCESS OR FAILURE?
Is it an achievable goal?

Yes, a series of SAILDRONES, a 19 feet long by 7 feet wide, fin keeled totally enclosed outrigger canoe type vessel fitted with a wing sail, have been developed jointly by the Universities of South Mississippi, Georgia and Washington, the US Marine Conservation Institute and NOAA/PMEL. It took ten years to develop their latest models that have clocked up 60,000 nautical miles while carrying out marine research in the Pacific Ocean and the Bering Sea. One SAILDRONE sailed 6000 nautical miles in 102 days at an average speed of 2.5 knots.

Obviously, the SAILDRONE Project had a wealth of talent and financial resources at its disposal. However, a well thought out craft, built to exacting standards and thoroughly tested and with a modicum of good luck, should be able to achieve the goal of crossing the Atlantic Ocean in Autonomous mode.

Failure Modes

Analysis of the attempts made by previous challengers highlighted a number of specific failure modes.

The first mode of failure was by wrecking. These vessels had been beach launched and due to their inability to sail away from the coast they have been brought ashore by the incoming tide, wind and waves.

The second mode of failure was due to being caught in the nets of a fishing boat or being unlawfully recovered from the sea by another larger vessel.

The third mode of failure was due to the inability of the vessel to report its position.

This is a specific requirement of the Rules governing the Microtransat Challenge and loss of regular reporting for a period of ten days results in disqualification. This failure mode may have been due to a number of factors - break-up and/or sinking of the boat; ingress of seawater into the wiring or equipment; battery failure or electronics failure. Some of these disqualified vessels may still be afloat and sailing towards their goal.

All of the boats, excepting OpenTransat, were very small and all of them were ill equipped to withstand the rigours of offshore ocean sailing. While the exercise in configuring and integrating the electronic equipment, sensors and controls that provide autonomy is a challenging one for students, not enough time and effort was taken to make sure the boat itself was 'ocean ready'.

Can we succeed?

Yes – we are paying an enormous amount of attention to the fine detail. We have produced an 'ocean ready' hull and sail design which is capable of recovery from total inversion by capsizing or pitch poling. Our electronics and battery packages are protected in a sealed watertight enclosure within the watertight hull. All wiring that connects external equipment to the internal control module passes through two separate modes of watertight integrity. We have made provision for flooding due to hull damage and lightning strikes. We aim to succeed where all others have failed and win the Microtransat Challenge for AYRS.

Decision

The AYRS Committee considered this application and decided to make an initial award of £1000 which would allow development of the prototypes to be continued and for details of the testing programme to be elaborated.

AYRS would also make a further award of up to £4000 which would need to be "match funded" to complete the project. This could be by the member own resources or by fund-raising through Kickstarter or similar or by grants from other bodies.

We understand that at the time of writing the Project is on hold.

In the meantime, a Norwegian team claim to have successfully made a crossing from Newfoundland to Ireland and onward to Norway.

Editor

North West UK Local Group Winter Meeting, 16th December 2017

Eight of the now thirteen strong North West Local Group braved the winter weather to attend the final meeting of the year, which also marked the end of the seventh year since the group was formed. As is now traditional, the meeting began at 12.30 pm with a buffet lunch which was enjoyed by all present, which included four of the member's wives.

The meeting began at 1.45 pm with an introduction by Mike Howard who began by updating the members present with the current status of the AYRS MCT2018 Challenge. Mike informed the meeting that two hull designs had been identified and that free sailing and radio control trials, using the wing sail which had been specifically designed for the Challenge, would be carried out to determine the most suitable hull form. Considerable effort has been expended in finalising the Power Budget, daily power consumption has been reduced from 13 Amps to 8 Amps which is within the calculated minimum capacity of the solar panels which will charge the batteries. An application to AYRS for financial support from the Howard Fund was completed in early December.

James related a tale about sailing on the Norfolk Broads in a traditional Broads hire craft. He complained about the inefficiency of the self tacking jib which seemed relatively small compared with the area of the mainsail. Mike, Adrian and John S explained to James how the technique of lee bowing was used on narrow waterways to gain ground when tacking. When the boat slows the jib is pulled aback to pay off the head onto the new tack. Mike also described a sail he had spotted in a 1908 edition of Yachting and Boating magazine where the majority of the jib was secured to a self tacking boom with just the aft overlap controlled by jib sheets. This arrangement meant that much less force was required when handling the jib sheets. Mike also related a salty tale of a collision he experienced on the Norfolk Broads when an out of control sailing craft rammed the yacht he was in command of.

Colin McCowen then presented his latest sail. It comprises a wing mast with a rectangular fully battened sail attached to the aft edge. It is controlled by multiple sheets, each one attached to the end of the full length battens, in a similar manner to a junk rig. The outriggers on his Canadian canoe have been replaced with 'skis' Trials with a plastic sail were satisfactory and it has now been replaced by a sewn sailcloth sail. 'It goes like stink' was how Colin described its performance. Colin also explained how he controls the wing mast angle of attack with a simple lever operation. However, not all his trials were without incident and a sorry tale of a capsize was included in his report.

From a prompt by another member, John S described his activities this year with the Open Canoe Sailing Group (OCSG). He described how one member has built a scaled down version of an International 10 Square Metre Canoe in strip planking. Colin suggested he might join in some of the OCSG activities next year. (Perhaps the AYRS NWLG could combine with the OCSG on one of their meetings next year).

Mike then described how he was attempting to design an 'Old Codgers' sailing dinghy. The premise was a dinghy with a reasonable turn of speed but one that you sat in rather than on. Light weight was critical to enable a physically impaired older person to launch and recover it single handed. He showed a 3D image of

a proposal he had found on an Internet blog on the subject. Mike also showed the lines and sections of his ideas, based on a dinghy design by Newman Darby many years ago. The cockpit, keel support and mast step would be a plywood monocoque structure with a skin of Correx.

Colin asked why not a plywood hull? Mike replied that he wished to reduce the weight and that he was still intrigued by the possibilities of utilising Correx sheet as a boat building material. Adrian suggested the Character Boats *Post Boat* met these requirements although requiring a trailer attached to a car and a substantial winch to aid recovery. James suggested several existing dinghies but Mike commented that they were all far too heavy. Mike also made mention of Kim Fisher's attempts to design an Optimist replacement. Again, weight was a critical component so that 5 to 10 years old could launch and recover the dinghy single handed. Mike stated that he intended to 'stitch' the Correx sheets together with monofilament fishing line in a double 'figure of eight' format. He had seen this method used with a plywood folding boat (Flapdoodle dinghy).

John A showed a model of a Transonic hulled kayak folded up from a 3.0 metre x 1.5 metre sheet of Correx. Mike agreed that the strict parameters of Calderon's Transonic Hull only really applied to high speed craft and that to gain displacement these parameters could be 'modified' for small low speed craft. Mike also stated that he had seen a similar design on the Internet which was about 3.5 metres long and configured as a single. James commented that the Centre of Gravity of a Transonic hull was well aft. Mike confirmed that it was usually found at 40% of the waterline length, measured from the transom. John stated that his kayak was designed to carry two people but Mike doubted whether there was enough displacement if the trim could be maintained.

Not all the conversations we have are about boats. A discussion about the excessive size of the roof beams in John A's new workshop led to talk about the old 'rule of thumb' formula to size up steel beams, which still holds true today. This led to talking about snow loads and a question to Brian prompted him to tell the members present of his skiing experiences in Canada as a young boy.

2017 has been a good year for the North West Local Group with three new members joining our ranks. Almost everybody is now engaged in developing their own, or helping to develop, new ideas. I hope that in 2018 we can build on this firm foundation.

Mike Howard.

Colin McCowen's sailing canoe

Combined OCSG/AYRS Meet at Coniston Water, April 20th to 22nd 2018

This report details a very pleasant visit to Coniston Water, in the Lake District, organized by The Open Canoe Sailing Group (OCSG) and which included members of the Amateur Yacht Research Society, North West Local Group - John Shuttleworth, Mark Hillmann and Colin McCowen. The event was very well organized with a safety briefing at 10.00 am before launching, a sign out/sign return sheet and a 'Buddy System,' where two or more boats agreed to stay close to each other. At the safety briefing we had been warned that the temperature of the water was a mere 4C. so if you fell in you would be incapacitated very quickly. Buoyancy aids were mandatory. John had a full dry suit on. He must know the hazards of cold water.

The weather was lovely, sunny with a very light breeze/gentle wind. John and I thought that if we sailed North to the Blue Bird Cafe we might have to paddle all the way back as the wind was so light. So instead, we sailed gently across the lake from the campsite at Coniston Hall on the Western shore, to the cafe at John Ruskin's house, Brantwood, on the Eastern shore. We tied up and had a really good coffee while sat on the terrace enjoying a view of the mountain called the Old Man of Coniston.

My canoe had a 4sq.m ex- windsurf learner's sail which might have been fractionally bigger than John's sail but we both tootled along with no great difference in performance in any direction. A good few of the canoes have their outrigger side floats positioned quite high above the water so that they can be seen sailing along some times with both floats out of the water thus reducing drag. They must be there for safety and/or stronger winds. A couple of OCSG people commented that they were surprised to see me sailing towards the stony shallow shore and then quickly revolve the aluminium cross tube so that the two keels on either end were lifted swiftly into the air. As the canoe is also fitted with a special shallow water rudder it can be easily hauled up on to the gravelly lake shore.

In the evening we met up again for a group meal at the Ship Inn. The food was excellent, stories and chat very interesting. During a lull in the conversation, while they were all enjoying the food, I got to my feet and on behalf of the AYRS members present, thanked them for such a well organized and enjoyable weekend.

Next day, Sunday, there was racing for those so inclined. The weather was dull, a bit drizzly, but a good breeze. At the age of 73, I had had enough sailing from the day before to not be bothered to get the canoe off the car roof rack again. I had not taken my 15ft wing mast which, together with the sail, makes 10sq m. or approx.100 sq ft. I considered Lake Coniston it to be too big a lake to be rescued from the middle in the event of a capsize. Instead, Val, my wife, and I watched some of the action, with the aid of a pair of binoculars from behind the protection of a glass windbreak at the Blue Bird Cafe, while drinking hot coffee.

Mark Hillman brought his plywood tenth scale mock up of his Self Righting Proa to the shore of Coniston. It generated a lot of interest from quite a few people. There is an extensive write up about it in a recent copy of Catalyst. (Number 51 – January 2017). When we were leaving we had a chat with an OCSG member, who had been sailing with his daughter. His boat is a light blue Solway Dory, which was an experimental boat, which had two extra long narrow stability floats. He was pleased to tell Val and me that he had recorded 12 knots using a satnav. The theoretical speed of a 16 ft displacement hull according to the Froude Formula should be 5.6 knots, so it just goes to show that you can go faster than the theoretical displacement speed if your hull is extra slim.

The wing mast and sail, I mentioned earlier in this article, have now been tested three times on a small lake near my home, Manley Mere, Helsby, near Frodsham, Cheshire. The second test ended when I forgot to release the mast steering control and did a slow but graceful, undignified capsize as I was tacking. It was 20 yards to the bank and part of the boat was stuck on the bottom. I had to lower myself into the water and do a fully clothed, buoyancy aided swim. The wing mast has performed perfectly since, even to the extent of my removing the two 29 litre safety floats at each end of the transverse aluminium cross tube.

I am currently working on kite pulled hydrofoils. It is still too early to give out details but the experiments are going well so far. I am hoping to publish details soon.

Colin McCowen

AYRS' stand at the Beale Park Boat Show

North West UK Local Group Summer Meeting, 9th June 2018

The meeting began at 2.00 pm promptly with Colin McCowen giving a report on the joint Open Canoe Sailing Group/AYRS North West Local Group meet at Coniston Water in the Lake District on the weekend of 20th to 22nd April. (A separate report is published in this edition of Catalyst).

Mike Howard then gave his impressions of the Northern Boat Show which had been held in Liverpool in conjunction with the Three Festivals/Tall Ship event over the late May Bank Holiday weekend. Mike stated the show was a dismal failure with very little of interest. The exhibitors he spoke to were bitterly disappointed by the turnout which had been 'talked up' in the press releases by the organisers. It was rumoured that the two principals behind the show had not even turned up at Liverpool! Mike felt that this was the end of a valiant effort to hold a boat show in the North of England.

John Shuttleworth then reported on his impressions of the Beale Park Boat and Leisure Show. He stated that, once again, the boat content of this show had shrunk year on year. AYRS, he said, seemed committed to Beale Park and had recruited several active members. The setting and location of the show was idyllic and he would probably continue to visit it. Adrian pointed out that even the London Boat Show had now been abandoned. The premier show now seems to be Southampton in September. In reply to a question by John Alldred, John Shuttleworth stated that the Makita Cordless Challenge was still in evidence although the joke seemed to be that if you utilised nine cordless drills you could be assured of a victory and win a tenth drill!

A short discussion took place about AYRS sponsoring a similar race where the overall weight of the boat and crew and the maximum permitted power would be stated, thus forcing the competitors to develop

an efficient, innovative and lightweight hull shape. It was felt by the meeting that this would not be feasible while Makita sponsored the current competition which was proving to be as popular as ever.

Mike Howard gave a short report on the Tall Ships visit to Liverpool on the late May Bank Holiday weekend. Only fifteen ships attended, most of which were sub fifty metre long ketches, schooners and brigs, which were berthed in the Canning and Albert Docks. There was a decided lack of the very large sailing ships, with the three largest ships berthed at the Cruise Liner Terminal. Mike said he had been privileged to be appointed the Liaison Officer for *Belem*, a three masted barque, the largest of the visiting ships. John Shuttleworth, who visited the event on the Sunday, stated that it was more of a family day out than a maritime event. He had enjoyed visiting the *Belem* and the steam tug/tender *Daniel Adamson*. Once again, Mike felt that this event had been 'talked up' in the publicity issued by the Liverpool City Council.

Mike then told the meeting of the demise of the AYRS MicroTransat Challenge 2018 project. John Shuttleworth stated that there had been very little reported to the AYRS NWLG about this project, considering it was supported by the group. Mike explained the background to the project and that it was little more than coincidence that had led to fifty percent of the project team being NWLG members. The project team had been made up of every AYRS member who had expressed an interest in the project back in March 2017. Several team members had dropped out along the way for personal reasons. Adrian Denye stated that the final six project team members had all the necessary skills and experience to make the project a success. Mike outlined the skills, two Naval Architects, both with small boat experience and one with a boat building background and one with mechanical and electrical engineering experience; an IT Consultant, who has been studying the event for the past five years; an experienced amateur sailor and Ocean voyager; a long term AYRS member with development skills and a young and aspiring Marine Engineer.

When asked why the project had been terminated, Mike stated that although they had been promised a sum of £5000 from the AYRS Howard Fund, this was insufficient to carry the project through to completion. The terms of the Grant were onerous, the team had to prove an 'Ocean Ready' craft before the final £4000 was released, against match funding by the project team. It was disappointing that the AYRS Committee had not appreciated the potential benefits of this project for AYRS as a body and given it its full financial backing. Mike stated he had written to the AYRS Chairman, Fred Ball about the issue of financial support. Richard Walker, the Project Director, was hoping for a meeting with Fred Ball in the near future to discuss the reasons behind the abandonment of the project.

The question was asked why the team did not complete a craft with lesser ability to prove the systems, etc. Mike stated that the team had determined that there was little point in pursuing this course of action. Mike stated that a comprehensive study of the equipment and the likely failure of the 23 previous attempts at completing this challenge had led the project team to this conclusion. This prompted the question of how much the project was to cost. Mike stated that to prepare, test, launch and recover the craft was estimated at close to £13,000. Asked to break down some of these costs Mike stated that the Weather Station alone cost £650 to £700. The Power Budget had taken Richard and Mike three months to reconcile. The deck area was to be covered with individual marine solar panels to give a high level of redundancy. Mark Hillmann suggested a towed electrical

generator, similar to a Walker Log. Mike said they had not considered this option as it was easily cut loose. Mark suggested this device might be utilised to increase the redundancy factor. Mark pointed out there was only twelve hours of daylight in the Tropics. Mike said this had been taken into account along with cloudy days and shadow generated by the wing sail in their Power Budget calculations.

Adrian Denye then took over and explained how he had built the prototype hull and its likely use now that the AYRS MTC 2018 project had been terminated. He stated he was interested in turning the hull into a junior trainer but he did not intend to make any dramatic changes so that it could revert to its former role if required in the future. The question was asked how it could accommodate a young person's weight. Adrian stated that the hull was designed to a displacement of 65 kilograms. Mike pointed out that, in fact, the batteries for the autonomous version weighed in at 22.5 kilograms. Adrian also stated that he believed that the rigid wing sail was the future but it had to be developed into a more user friendly form. Adrian said he was also interested in using his craft for the development of a wing sail which incorporated an upper area which could be made to feather automatically to reduce the power of the sail.

Mike told the meeting of his disappointment at the lack of content of Catalyst 53. He had written to the Editor, Simon Fishwick, expressing his dismay at the omission of the AYRS NWLG Report on the Winter Meeting, the detailed content of the AYRS AGM and subsequent Winter Meeting and Richard Walker's application to the Howard Fund. Mike said he had been amazed to find that in Simon's reply to his letter, that the volume of the magazine was governed by the postage cost for a 100 gram document. Mike said he had written back to Simon stating that, surely, it was the Editor's job to keep the membership informed of all past, current and future events and projects. For anadditional postage cost of approximately £150, which allowed for a document weight of 225 grams, this should not be an issue for an organisation with assets of £58,000. Mark stated he felt that Catalyst 53 showed a lack of commitment.

A discussion on the difficulty in recruiting people to serve on the AYRS Committee led to several members expressing their experiences. The lack of will to undertake these onerous positions seemed the most popular reason, although the increasing legal obligations of officers of the Society may contribute. Mark stated he got the impression from the AGM that the majority of the Committee would be more than happy to resign if someone else volunteered to take their place. John Shuttleworth stated that in an organisation to which he belonged they had supplemented the committee system with Advisory Groups comprising only of members interested in promoting specific aspects of the organisation or specific projects within it. Mark stated that his experience in the Cumbria based ski club was that members were very willing to volunteer if the task in hand benefited the majority. When building a ski tow, almost 50% of the members turned out to help construct it.

On a lighter note, Colin McCowen outlined his plans for a World record breaking Hagerdoorn hapa machine. He gave an illustrated talk outlining the development of Didier Costas' hapa design and his own design which he had demonstrated to the members at the AYRS NWLG Summer Meeting at Manley Mere.. A number of members pledged their support with offers of practical help.

Mark Hillmann closed the meeting with a summary of his progress on his self

righting Proa, He has completed the scale model and is presently testing a number of sail designs, the first of which he admitted did not perform well. Mike asked him if his Proa was a standard MADNESS design. Mark said he had bought a kit from Fyne Boats in Kendal but had increased the width of the bottom to give more displacement. He also stated that he hopes to move to Windermere permanently in the near future but will not be selling his cruising boat, which he keeps at Maryport, until the Proa has proven itself at full scale.

Mike concluded the meeting about 5.30 pm by reminding the members about the Summer Outing to Winsford Flash Sailing Club on Saturday the 11th August, the Autumn and Winter Meetings as well as an outing planned for October to the Science and Technology Museum in Manchester.

North West UK Local Group Autumn Meeting, 8th September 2018

The meeting commenced with Mark Hillman outlining the development of a suitable sail system for his Proa. He is now on the third development. He passed around a drawing showing the general layout of the sail plan. The main sail is a Bermudan sail which wraps around the mast. This eliminates much of the drag generated by a conventional mast section. The twin trailing edges (leech) are attached together with Velcro in the region of the conventional short sail battens. The sail can be slab reefed which then enables the upper portion of the mast to telescope within the lower mast. This feature reduces windage and lowers the centre of effort and the centre of gravity of the rig. To avoid the use of excessively large diameter tubes, the upper mast is stayed. The mainsail is supported at its lower edge by a wishbone boom which extends forward to carry the tack of a small self- trimming jib sail. A strut between the mast and boom, which is angled upwards, acts in the same way as a kicking strap (vang). Much discussion surrounded this subject with opinions being sought and given in equal measure. Mark seemed delighted with the interaction.

Colin McCowen then gave a presentation of his development of a radio controlled kite which he intends to use to tow his hapa. Much of his talk surrounded the theory of flight, the advantages of the dihedral wing configuration, control surfaces and the use of a radio control module and servos. A separate discussion took place on the use of carbon fibre to reinforce or stiffen existing structures. The consensus was that it was an expensive, difficult material to handle and it was probably better to use Kevlar for general stiffening purposes.

James made mention of a dissertation he had undertaken as part of his Marine Engineering Degree course. He had investigated shape versus lift for a variety of foil shapes when used as daggerboard, centreboards or rudder blades. He had commenced with a simple rectangular cross section and progressing through several stages to a full airfoil section. He stated he had been surprised at the apparent huge jump in efficiency by simply rounding the nose of the foil. Incremental increases then occurred as he first rounded the trailing edge, tapered the trailing edge and then finally produced a completely symmetrical airfoil section. This led to a discussion about foiling Moth class dinghies and their unusual cranked boom. The engineers present explained why this shape was more efficient that a straight boom. Further discussions on Reynolds Numbers, Froude and boat speed led Mark to offer the following rule of thumb which is used by the wardens on Windemere.:

Time in seconds between stern waves x 3
= boat speed in knots.

Several members, having enjoyed days out during the Summer, outlined places of interest. These included Ironbridge and Blyth Village; both in Derbyshire, Beamish Steam Museum in Northumberland; the *Daniel Adamson*, a Merseyside based restored steam powered Tug/ Tender, which carries out tours of the river

Mersey, Manchester Ship Canal and river Weaver. Mike recited a brief history of the ship, the only steam powered Tug/Tender in working order in the UK.

John Alldred mentioned the Leigh Canal Festival which is taking place on the weekend of 15th/16th September. He also mentioned a visit to the National Waterways Museum at Ellesmere Port, organised by his local Rotary but open to all comers, which is on the 10th October.

Finally, Mike Howard stated that he had purchased a Selway Fisher STORNOWAY dinghy. He showed photographs and a brochure of this dinghy. The dinghy is just the finished hull and so is a blank canvas. Mike hopes to turn it into a sailing dinghy, using his stock of spars, sails and fittings.

North West UK Local Group Winter Meeting, Saturday 8th December 2018

The members assembled around midday and were then invited to enjoy a buffet lunch, which has become the custom before the Winter Meeting of this Group, which is celebrating the conclusion of their eighth year together.

Once settled down, Mike announced that in early November he had been co-opted onto the AYRS Committee and his appointment would hopefully be confirmed at the Annual General Meeting which is to be held on the 20th January 2019. Mike then outlined his interaction with the committee and the completion of the Members Questionnaire and the updating of both the Data Privacy Policy and the Health & Safety Policy. There was some discussion about the necessity of the latter two documents for an organisation such as AYRS. The view was expressed that many older people do not see the need for 'bits of paper' which seem to have replaced common sense for one's own well being. Mike stressed that AYRS was under a legal obligation to have these documents. It was important to show 'due diligence' in every aspect of running the Society.

In advance of the general publication of his discussion document on the future of AYRS, Mike made a presentation entitled, What is our Future – Expansion or Dissolution? There followed a lively discussion for over an hour or so which can be summarised as follows:

- Several members were shocked to hear that the current membership has dropped to 225.
- All members present saw a need for more active members. The idea of promoting other regional groups was endorsed.
- Most members agreed that a simpler hard copy regular communication in the form of a News Letter, full of 'boating news' was preferable to the occasional editions of a 'rather highbrow' glossy magazine like Catalyst.
- Whilst some members embraced the idea of a digital Catalyst others preferred a hard copy. Several members indicated that they utilise their computers very little in retirement and do not access their e-mail account on a regular basis.
- The RYA Dinghy Show and Beale Park Boat Shows were discussed. Several members saw difficulty in prising young members away from their allegiance to their chosen dinghy class into a more generalised arena. One member expressed the opinion that Beale Park Boat Show was losing credibility with the professional boatbuilding community It was agreed that a meeting or event should follow closely on from a boat show attendance by AYRS in order to keep alive new members or potential members interest in the Society.
- There was no enthusiasm for either the Northern Boat Show or the Western Boat Show as the target audience was too fragmented within the general public, who can access these shows free of charge.
- There was much enthusiasm for targetting the prime UK Boat Show at Southampton where 80% of attendees were 'boating people'. It was felt that manning levels of two/three persons on the stand per day could be sustained on the basis of two days per person. A suggestion that we apply for a free stand as a charity intent on bringing newcomers into boating was greeted with

much scepticism. Another suggestion was to share a stand with 'another organisation'.

- There was a lot of enthusiasm for targetting Universities, Colleges teaching marine subjects and boat building academies. (see comments on sponsorship)
- Sailing Clubs, it was suggested, were another target market. AYRS members could make a presentation as part of a recruitment drive. Many Sailing Clubs hold Winter evening lectures which are immensely popular. One member cited an audience of 80 members.
- Howard Fund sponsorship of student projects was warmly welcomed. A suggestion that we team up with a commercial sponsor might add more weight to getting projects accepted by students and create more commercial relevance. One suggestion was a set of standard hydrofoils which could be attached to a variety of popular sailing dinghies, thus driving down the cost of custom sets for each class of dinghy.

Mike introduced the idea, suggested by Fred Ball, of an AYRS sponsored attempt at the Hydrofioil Class in the 2019 Open Cordless Challenge which is to be held at the Beale Park Boat Show at the end of May 2019.. John S suggested that the innovation had disappeared from this event with the deletion of the restricted power class. He felt there was now too much emphasis on whoever could afford the most power would win. He thought that a professional organisation would probably win the Hydrofoil Class. Amongst the members present there was little practical knowledge of either powered or human propelled hydrofoil boats and little enthusiasm to get involved in this project.

Colin then updated the meeting on his attempts at developing a kite or glider powered hapa. The Summer had been very hot and very calm, he related, and although he had increased his knowledge of flight control he had been unable to conduct any meaningful trials. He drew the members attention to a website entitled 'flight school' (www.amaflightschool.org), which specialised in electrically powered model aeroplanes. He also mentioned the latest wireless remote control system which incorporates an 'Oh Sh*t' button. If your plane gets out of control, rather than try to recover it manually, you press the 'Oh Sh*t' button and an electronic gyroscope fitted inside the model restores it to level flight. This caused much amusement.

Finally, Mark outlined his latest development of his self righting proa project which has been awarded a Howard Fund grant. He is currently having a custom set of sails made for his quarter scale model by sailmaker, Steve Goacher at Windermere, Cumbria. These include luff sleeve fastenings to allow the sail to be reefed as the retractable mast sections are lowered to reduce windage and lower the Centre of Effort of the sail. A lively discussion took place on his righting theory. Some members, not conversant with proas did not get it while others, agreed with Mark's theory.

AYRS Member John Perry's rowboat; also at Beale Park (John having rowed it down the Thames from Lechlade over several days)

Catalyst Calendar

This is a free listing of events organised by AYRS and others. Please send details of events for possible inclusion by post to Catalyst, BCM AYRS, London WC1N 3XX, UK, or email to **Catalyst@ayrs.org**

January 2019

20th All-Day AYRS Meeting
9.30am-4pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, Surrey .Tea and coffee available but bring your own lunch. Donations invited to pay for hall. Further details from Fred Ball, tel: +44 1344 843690; email: fball@ayrs.org.

20th AYRS Annual General Meeting
4pm-5pm, Thorpe Village Hall, Thorpe, Surrey, after the All-Day meeting (see above). Agenda, Committee report and other papers will be posted in the AYRS Forum https://www.ayrs.org/forum.
AYRS desperately needs new Committee members, especially those with computer skills! Contact: Fred Ball tel: +44 1344 843690; email: fball@ayrs.org

February 2019

6th Visit to Manchester Museum opf Science * Industry.
Contact: Mike Howard, email: ecotraction@aol.com

March 2019

2nd - 3rd RYA London Dinghy Show, Alexandra Palace London N22 7AY.
The RYA Dinghy Show is the only show in the world dedicated to Dinghy Sailing. It's a great day out for all the family and offers visitors the opportunity to visit the AYRS on Stand A6!

16th AYRS NW UK Local Group Spring Meeting, 2pm
Lydiate Merseyside
Contact: Mike Howard, email: ecotraction@aol.com

April 2019

26th-28th Sailing Meeting
Coniston Water, Lake District, UK. Joint with Open Canoe Sailing Group; contact Mike Howard, email: ecotraction@aol.com

May 2019

TBA Sailing Trials Weekend
Portland and Weymouth Sailing Academy, Portland Harbour, Dorset UK
A weekend messing around with boats in Portland Harbour. For more details contact Norman Phillips email: wnorman.phillips@ntlworld.com

31st – 2nd June Beale Park Boat Show, near Pangbourne.
As before AYRS will have a stand and would appreciate small exhibits and displays and, of course, offers of help to run the stand. Contact: Fred Ball, email fball@ayrs.org

June 2019

15th AYRS NW UK Local Group Summer Meeting, 2 pm
Lydiate, Merseyside(?) Contact: Mike Howard, email: ecotraction@aol.com

September 2019

14th AYRS NW UK Local Group Autumn Meeting
Contact: Mike Howard, email: ecotraction@aol.com

October 2019

5th – 11th Weymouth Speedweek
Portland and Weymouth Sailing Academy, Portland Harbour, Dorset UK. See http://www.speedsailing.com/ More experimental boat entries are welcome and wanted!

9th Speedsailing
AYRS Weymouth meeting
19.30 for 20.00hrs, Weymouth Sailing Club, Nothe Parade, Weymouth, Dorset DT4 8TX. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX. Check the AYRS website before going just in case the location changes (unlikely)!

November 2019

3rd (TBC) AYRS London Area meeting
9.30am to 5pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, near Staines
Bring your lunch - tea and coffee available. Donations invited to pay for the hall. Details from Fred Ball, tel: +44 1344 843690; email fball@ayrs.org.

December

7th AYRS NW UK Local Group Winter Meeting
Lydiate Merseyside, 12.30. Includes buffet lunch. Donations invited.
Contact Mike Howard, ecotraction@aol.org.

Catalyst — *a person or thing acting as a stimulus in bringing about or hastening a result*

On the Horizon . . .

Nothing much really.

Would you like to write something?

Email it to catalyst@ayrs.org please.
Guidance notes are inside the front cover.

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Amateur Yacht Research Society
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